

2009 Math

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Question 1 (Data Analysis and Probability)

A mother is keeping a record of how her new baby’s weight changes as the baby grows. The mother's record is shown in the table below.

Age	Weight (pounds)
Birth	7
1 month	9
2 months	11
3 months	13
4 months	14
5 months	15.5
6 months	16
7 months	17
8 months	17.5
9 months	18
10 months	18.5

What type of graph should she use to show how the baby’s weight changed over time?

- ☐ A. line graph
- ☐ B. histogram
- ☐ C. circle graph
- ☐ D. box-and-whisker plot


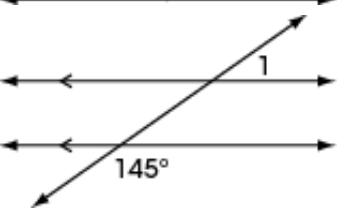
Question 2 (Patterns, Functions and Algebra)

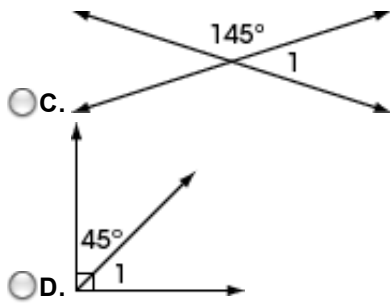
Jill charges a base rate of \$25 per lawn plus \$18 for each hour she mows the lawn. Which equation gives the amount of money, m , Jill earns from mowing a lawn for h hours?

- ☐ A. $m = 25h + 18$
- ☐ B. $m = 18h + 25$
- ☐ C. $m = \frac{h - 18}{25}$
- ☐ D. $m = \frac{h - 25}{18}$

Question 3 (Geometry and Spatial Sense)

In which figure is the measure of $\angle 1$ equal to 45° ?

- ☐ A. 
- ☐ B. 



Question 4 (Data Analysis and Probability)

Leroy has a number cube with sides labeled 1 through 6. He tosses the number cube 4 times. Each toss results in a 5.

What is the likelihood that the next toss will result in a 5?

- ☐ A. $\frac{1}{1}$
- ☐ B. $\frac{1}{4}$
- ☐ C. $\frac{1}{5}$
- ☐ D. $\frac{1}{6}$

Question 5 (Measurement)

For lunch Fanya drank a can of cola that had a diameter of 2 inches and a height of 5 inches. After school, she drank a can of juice that measures twice the diameter and twice the height of the can of cola.

In your **Answer Document**, find the volume of each can. Show work or provide an explanation to support your answers.

Determine how many times larger the volume of the juice can is than the volume of the cola can.

Question 6 (Number Sense)

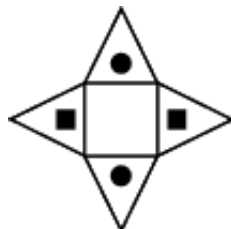
A virus measures 0.000022 mm in length.

Which value expresses the length of the virus in scientific notation?

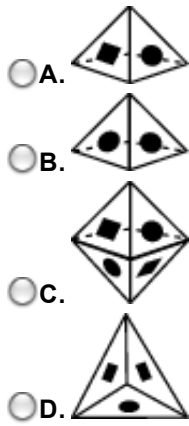
- ☐ A. 2.2×10^{-4} mm
- ☐ B. 2.2×10^{-5} mm
- ☐ C. 2.2×10^{-6} mm
- ☐ D. 2.2×10^{-7} mm

Question 7 (Geometry and Spatial Sense)

This net is folded to produce a three-dimensional object.



Which object will this net produce?



Question 8 (Patterns, Functions and Algebra)

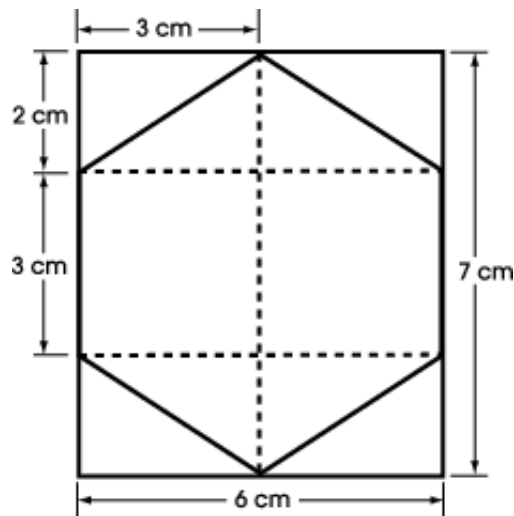
At the beginning of the day, the owner of a restaurant opens a new case of take-out boxes. One case holds 500 take-out boxes. He uses an average of 35 take-out boxes each day.

Based on his average usage, which expression represents the number of take-out boxes that remain d days after the new case of boxes is opened?

- ☐ A. $500 - 35d$
- ☐ B. $500 + 35d$
- ☐ C. $500d - 35$
- ☐ D. $500d + 35$

Question 9 (Measurement)

The diagram shows a hexagon drawn inside a rectangle.



What is the area of the hexagon?

- ☐ A. 21 cm^2
- ☐ B. 24 cm^2
- ☐ C. 30 cm^2
- ☐ D. 54 cm^2

Question 16 (Data Analysis and Probability)

Tonya and her friends earned extra money by mowing lawns around their neighborhood. Tonya created a table to show their earnings.

Name	Earnings
Tonya	\$34
Betty	\$34
Jose	\$34
Mario	\$25
Eliza	\$22
George	\$22
Sue	\$17
Pedro	\$ 8

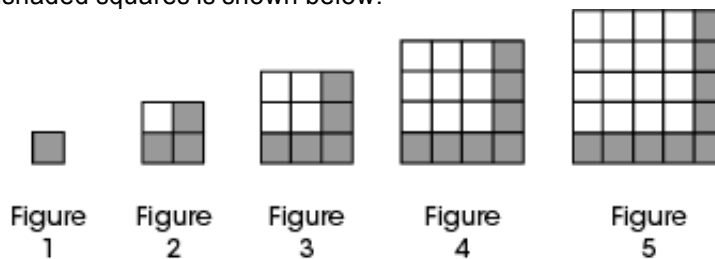
Pedro noticed that Tonya made a mistake. His earnings were \$24, not \$8.

How does this change affect the mean of the group's earnings?

- ☐ A. The mean remains the same.
- ☐ B. The mean increases by \$2.00.
- ☐ C. The mean increases by \$3.00.
- ☐ D. The mean decreases by \$9.00.

Question 17 (Patterns, Functions and Algebra)

A pattern of shaded and unshaded squares is shown below.

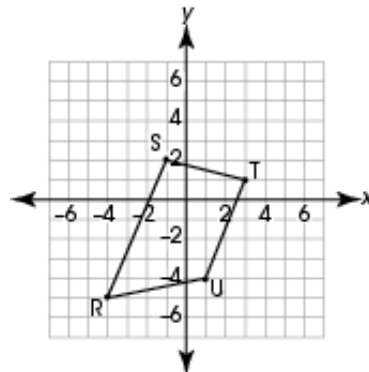


In your **Answer Document**, find a formula for or describe in words the number of shaded squares in the n^{th} figure.

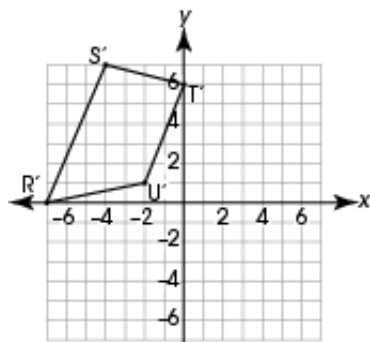
Find the number of shaded squares in the 50th figure. Show your work or explain your answer.

Question 18 (Geometry and Spatial Sense)

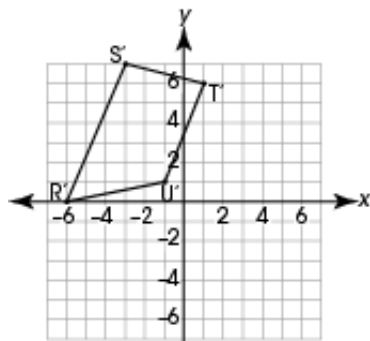
Trapezoid RSTU is shown on the grid.



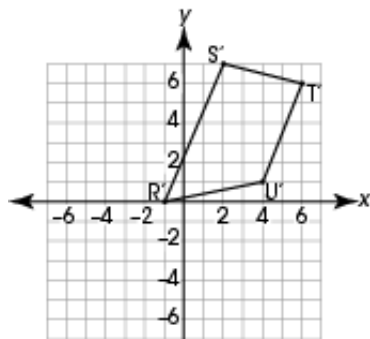
Which graph shows the image of trapezoid RSTU after it is translated 5 units up and 3 units to the left?



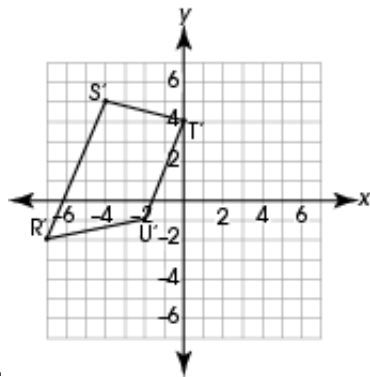
☐ A.



☐ B.



☐ C.



☐ D.

Question 19 (Number Sense)

Four numbers are shown.

$$\frac{31}{4}, 7\frac{5}{8}, \sqrt{50}, 7.82$$

Which shows these numbers ordered from least to greatest?

☐ A. $7\frac{5}{8}, \frac{31}{4}, 7.82, \sqrt{50}$

☐ B. $\sqrt{50}, 7.82, \frac{31}{4}, 7\frac{5}{8}$

- ☐ B. $\sqrt{50}$, $7\frac{5}{8}$, $\frac{31}{4}$, 7.82
- ☐ C. $\sqrt{50}$, $7\frac{5}{8}$, $\frac{31}{4}$, 7.82
- ☐ D. $\frac{31}{4}$, $\sqrt{50}$, $7\frac{5}{8}$, 7.82

Question 20 (Measurement)

Zack is packing for a trip to Scotland. He read that the average temperature in the summer is 18°C during the day and 7°C during the night.

$$F = \frac{9}{5}C + 32$$

What is the difference between the high and low temperatures in degrees Fahrenheit?

- ☐ A. 19.8°F
- ☐ B. 43.0°F
- ☐ C. 51.8°F
- ☐ D. 77.4°F

Question 21 (Patterns, Functions and Algebra)

A grocery store has a triangular pyramid of soup cans on display. Steven counts the number of cans in each of the top five layers. Each successive layer continues following the same pattern.

Layer	Number of Cans
1	1
2	3
3	6
4	10
5	15

The display has 10 layers. How many cans are in the 10th layer?

- ☐ A. 25
- ☐ B. 30
- ☐ C. 45
- ☐ D. 55

Question 22 (Data Analysis and Probability)

Local residents have requested a traffic light at the intersection of Polk Road and Vine Street. They claim that the intersection has become unsafe for their children due to the high volume of drivers using these roads as shortcuts during rush hour from 4 p.m. to 6 p.m.

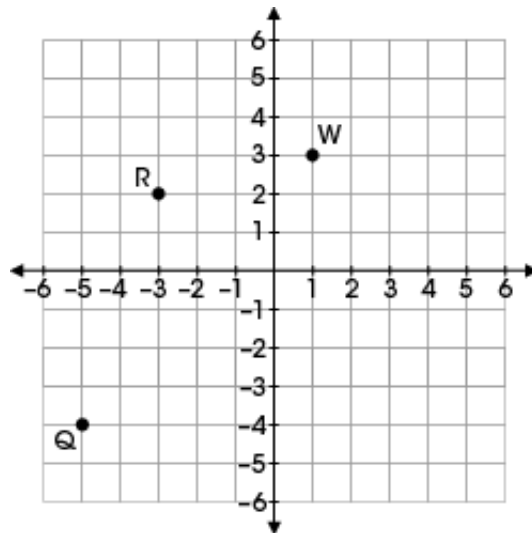
In response, the street department installed a device that would count cars going through the intersection. The device counted the total number of cars each day for a two-week period. The department used the results to determine the average number of cars passing through the intersection each day. They decided the number was normal for an intersection with no light, and refused the residents' request.

In your **Answer Document**, explain how the residents can claim that the method the department used to collect the data does **not** provide valid information for evaluating their request.

Explain how the department's method can be altered to provide more valid data. (2 points)

Question 23 (Geometry and Spatial Sense)

Points Q, R, and W are plotted on the coordinate grid.



Where should point Z be plotted so that parallelogram QRWZ is formed?

- ☐ A. $(-2, -6)$
- ☐ B. $(-1, -3)$
- ☐ C. $(3, -2)$
- ☐ D. $(2, -1)$

Question 24 (Measurement)

A manufacturer wants to make a rectangular storage box with volume 0.75 cubic meters, length 1.5 meters, and width 0.4 meters.

What is the height of this box?

- ☐ A. 0.15 m
- ☐ B. 0.45 m
- ☐ C. 0.80 m
- ☐ D. 1.25 m

Question 25 (Patterns, Functions and Algebra)

Kim is selling sandwiches for a school fundraiser. She made the chart below to help her with pricing.

Number of sandwiches x	Cost $f(x)$
3	\$ 3.45
5	\$ 5.75
8	\$ 9.20
12	\$13.80

Which function represents the cost of the sandwiches?

- ☐ A. $f(x) = 1.15x$
- ☐ B. $f(x) = 3.45x$
- ☐ C. $f(x) = 1.15x + 3.45$
- ☐ D. $f(x) = x^2 + 1.15x - 9$

Question 26 (Data Analysis and Probability)

A banquet center offers a choice of 3 salads, 5 main courses and 4 desserts.

A banquet center offers a choice of 3 salads, 8 main courses and 4 desserts.

How many different meals can be created by selecting one salad, one main course and one dessert?

- ☐ A. 12
- ☐ B. 20
- ☐ C. 35
- ☐ D. 60

Question 27 (Number Sense)

Joel has a 50-meter roll of copper wire that weighs 7.5 kilograms. Approximately how many meters of wire will be in a new shipment that weighs 502.5 kilograms?

- ☐ A. 75 m
- ☐ B. 610 m
- ☐ C. 3,350 m
- ☐ D. 3,770 m

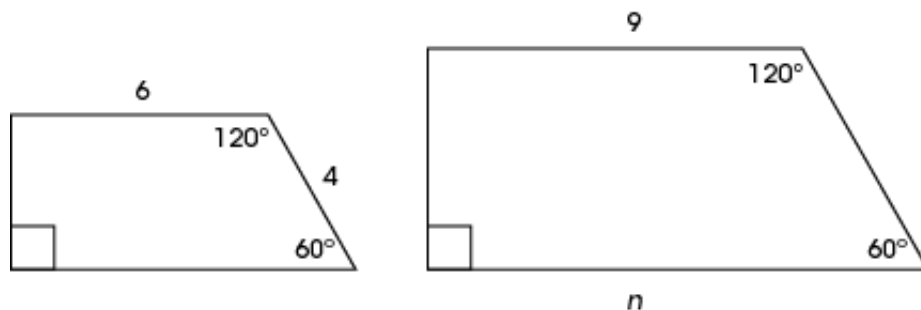
Question 28 (Patterns, Functions and Algebra)

Frank makes and sells small picture frames. His revenue from sales can be represented as $R = \$13.60x$ for x frames sold. The cost of making the frames can be represented as $C = \$5.80x + \120 for x frames made.

In your **Answer Document**, determine the minimum number of frames Frank must make and sell in order for his revenue to be greater than his costs. Show your work or provide an explanation for your answer.

Question 29 (Geometry and Spatial Sense)

Similar trapezoids are shown.



What is the value of n ?

- ☐ A. 10
- ☐ B. 12
- ☐ C. 15
- ☐ D. 19

Question 30 (Number Sense)

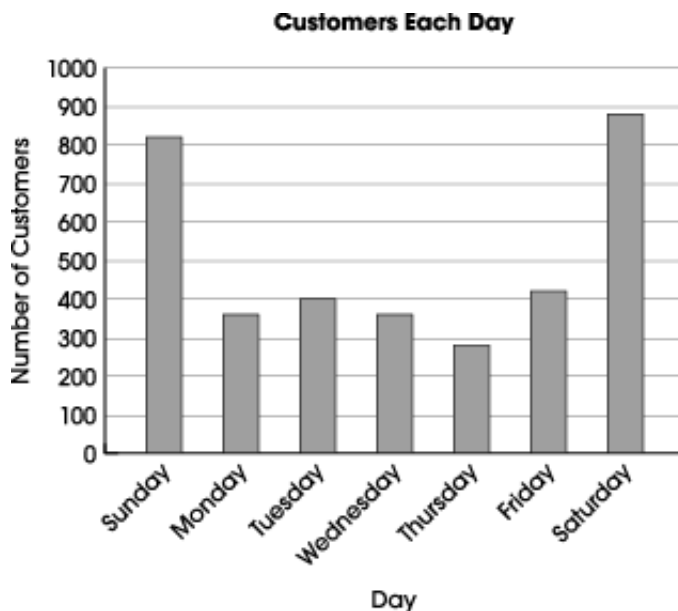
The value of x is even, and the value of y is odd. Which expression will produce an even number?

- ☐ A. $x + 2y$
- ☐ B. $2x + y$
- ☐ C. $x^2 + y^2$

☐ D. $(x + y)^2$

Question 31 (Data Analysis and Probability)

The bar graph shows the number of customers in Rio's restaurant each day last week.

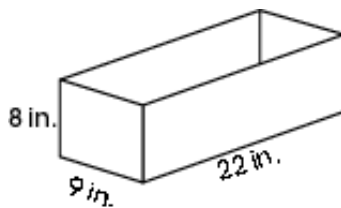


What is the approximate mean number of customers per day in Rio's restaurant last week?

- ☐ A. 360
- ☐ B. 400
- ☐ C. 440
- ☐ D. 500

Question 32 (Measurement)

Mitchell is planting tulip bulbs in a rectangular planter with the dimensions shown.



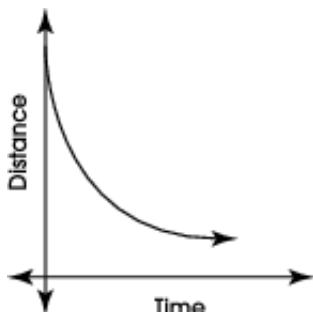
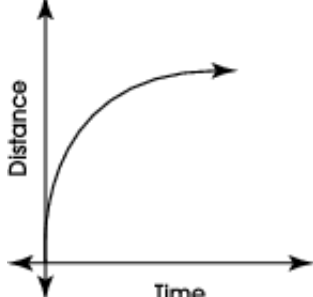
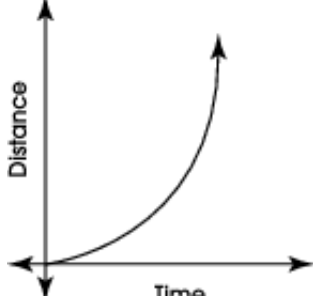
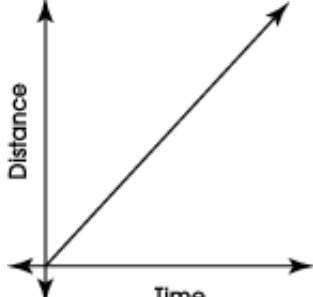
Mitchell plans to fill $\frac{3}{4}$ of the planter with soil.

How much soil will Mitchell need?

- ☐ A. 1,188 cubic inches
- ☐ B. 1,584 cubic inches
- ☐ C. 2,107 cubic inches
- ☐ D. 11,880 cubic inches

Question 33 (Patterns, Functions and Algebra)

When a car travels at a constant rate, distance varies directly with time. Which graph could represent the distance as a function of time?

- ☐ A. 
- ☐ B. 
- ☐ C. 
- ☐ D. 

Question 34 (Number Sense)

The employees of a company will vote on two options for pay increases. The first option states that each employee will receive a \$500 raise; the second option states that each employee will receive a 2% raise.

The table shows the annual salaries of the employees of the company.

Annual Salaries of Employees

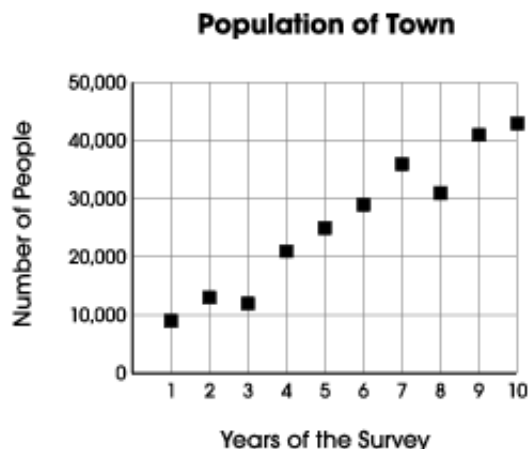
Annual Salary	Number of Employees Receiving the Salary
\$18,500	6
\$20,300	10
\$24,100	18
\$31,000	21
\$42,000	5
\$58,000	3
\$71,000	1

In your **Answer Document**, determine which option is likely to receive the most votes. Support your response by comparing the effects of each option on the given salaries.

comparing the effects of each option on the given salaries.

Question 35 (Data Analysis and Probability)

A town census was conducted every year for the past 10 years. The scatterplot below shows the results of the census.

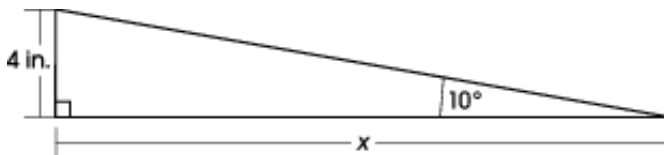


If the linear trend continues, which prediction is supported by the data?

- ☐ A. The population will stay the same for the next 5 years.
- ☐ B. The population will reach 120,000 within the next 10 years.
- ☐ C. The population will decline steadily over the next 10 years.
- ☐ D. The population will exceed 50,000 people within the next 5 years.

Question 36 (Geometry and Spatial Sense)

A ramp is being built next to a 4-inch-high sidewalk, as shown in the diagram below.



Which trigonometric relationship could be used to find the value of x ?

- ☐ A. $\cos 10^\circ = \frac{4}{x}$
- ☐ B. $\cos 10^\circ = \frac{x}{4}$
- ☐ C. $\tan 10^\circ = \frac{4}{x}$
- ☐ D. $\tan 10^\circ = \frac{x}{4}$

Question 37 (Patterns, Functions and Algebra)

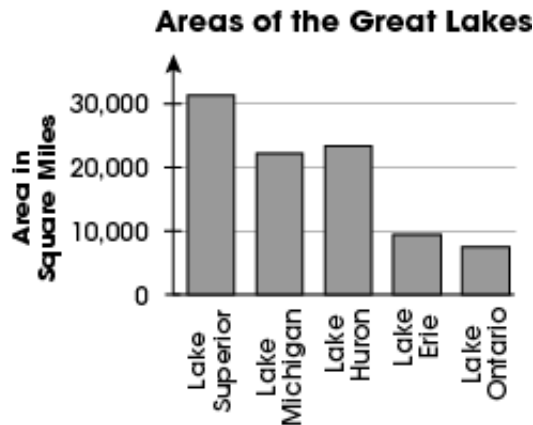
The number of hamburgers sold at a local restaurant varies inversely with the price that is charged. The number, n , of hamburgers sold at a price, p , in dollars can be found using the formula $n = \frac{687.5}{p}$. Approximately how many hamburgers did the restaurant sell if the price of the hamburgers was \$3?

- ☐ A. 278

- ☐ B. 229
- ☐ C. 225
- ☐ D. 215

Question 38 (Data Analysis and Probability)

The areas in square miles of the Great Lakes are shown in the bar graph.

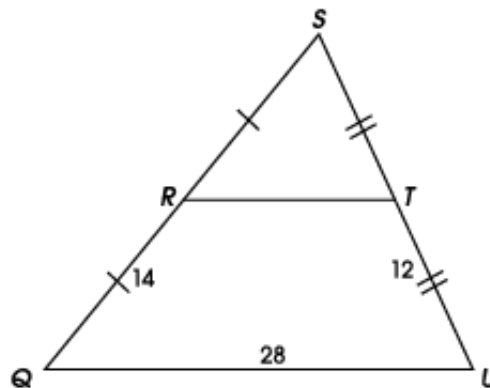


Based on this graph, which set of numbers is the closest to the total area of the five Great Lakes?

- ☐ A. between 70,000 and 80,000 square miles
- ☐ B. between 80,000 and 90,000 square miles
- ☐ C. between 90,000 and 100,000 square miles
- ☐ D. between 100,000 and 110,000 square miles

Question 39 (Measurement)

Points R and T are the midpoints of the sides of triangle QSU , as shown in the diagram below.



What is the perimeter of $\triangle RST$?

- ☐ A. 26
- ☐ B. 40
- ☐ C. 54
- ☐ D. 80

Question 40 (Geometry and Spatial Sense)

The vertices of a kite are located at the points $P(-2, -1)$, $Q(-1, -2)$, $R(-2, -5)$, and $S(-3, -2)$. The image of the kite is reflected over the x -axis, and then the reflected image is translated 3 units to the right and 2 units up.

In your **Answer Document**, provide the coordinates for the vertices of the final image of the kite. Provide a graph, calculations or reasoning to explain how you determined the coordinates.

Question 41 (Number Sense)

What is the value of the expression $n^2 - \frac{w^2}{q}$ if $n = \frac{1}{3}$, $w = -6$ and $q = \frac{2}{3}$?

- ☐ A. $-53\frac{8}{9}$
- ☐ B. $-23\frac{8}{9}$
- ☐ C. $24\frac{1}{9}$
- ☐ D. $54\frac{1}{9}$

Question 42 (Data Analysis and Probability)

Population data for Ohio is provided in the table below.

1998 Ohio Population Data

	Male	Female	Total
White/Nonhispanic	4,459,172	4,950,779	9,409,951
Hispanic	76,660	79,554	156,214
Black	606,772	682,989	1,289,761
All other	72,969	78,608	151,577
Total Population	5,215,573	5,791,930	11,007,503

Based on the data, what is the probability, rounded to the nearest ten thousandth, that a male selected at random in Ohio in 1998 would have been Hispanic?

- ☐ A. 0.4910
- ☐ B. 0.0170
- ☐ C. 0.0147
- ☐ D. 0.0070

Question 43 (Patterns, Functions and Algebra)

A company is comparing two different postage plans for next year. The company can purchase a postage plan where the total cost, c_1 , is \$45,000 plus \$3,000 per mailing, where n is the number of mailings. The cost, c_2 , of the other plan is \$0.35 for each piece, p , mailed. Which of the following is a set of equations modeling the costs of the two plans?

- ☐ A. $c_1 = 45000n + 3000$ $c_2 = 0.035p$
- ☐ B. $c_1 = 45000 + 3000n$ $c_2 = 0.35 + p$
- ☐ C. $c_1 = 45000n + 3000$ $c_2 = 0.35 + p$
- ☐ D. $c_1 = 45000 + 3000n$ $c_2 = 0.35p$

Question 44 (Measurement)

The Johnsons were going to a family wedding and drove a total of 1,244 miles to reach their cousin's house. They spent 9 hours driving the first day at an average speed of 60 miles per hour. They reached their cousin's house on the second day after driving 11 hours.

What was their average speed on the second day?

- ☐ A. 60 miles per hour
- ☐ B. 62 miles per hour
- ☐ C. 64 miles per hour
- ☐ D. 78 miles per hour